



Radioimmunotherapy (RIT)

Radioimmunotherapy (RIT) is a combination of radiation therapy and immunotherapy used to treat non-Hodgkin B-cell lymphoma and other types of cancer. RIT uses engineered monoclonal antibodies paired with radioactive materials called radiotracers. When injected into the patient's bloodstream, they bind to cancer cells and deliver a high dose of radiation directly to the tumor.

If you're scheduled for RIT, your doctor will instruct you on how to prepare and how to take any necessary radiation safety precautions. Tell your doctor if there's a possibility you are pregnant or if you're breastfeeding and discuss any recent illnesses, medical conditions, medications you're taking and allergies, especially to anesthesia or contrast materials. Your doctor may advise you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners several days prior to your procedure. Leave jewelry at home and wear loose, comfortable clothing.

What is Radioimmunotherapy and how is it used?

Radioimmunotherapy (RIT) is a combination of radiation therapy and immunotherapy. In immunotherapy, a laboratory-produced molecule called a monoclonal antibody is engineered to recognize and bind to the surface of cancer cells. Monoclonal antibodies mimic the antibodies naturally produced by the body's immune system that attack invading foreign substances, such as bacteria and viruses.

In RIT, a monoclonal antibody is paired with a radioactive material, or radiotracer. When injected into the patient's bloodstream, the radiation-linked monoclonal antibody, or agent, travels to and binds to cancer cells, allowing a high dose of radiation to be delivered directly to the tumor. The agent used today is Yttrium-90 Ibritumomab Tiuxetan (Zevalin®). Iodine-131 Tositumomab (Bexxar®) is no longer on the market.

RIT is currently used to treat:

- non-Hodgkin B-cell lymphoma (NHL), including both new patients and patients who have not responded to chemotherapy and treatment with the monoclonal antibody Rituximab®.
- other sub-types of lymphoma.

Several new radioimmunotherapy agents are under development or in clinical trials. Potential uses for RIT include the treatment of prostate cancer, melanoma, ovarian cancer, leukemia, high-grade brain glioma and colorectal cancer.

Who will be involved in this procedure?

A radiologist, nuclear medicine physician or radiation oncologist and other healthcare professionals, such as an oncologist or medical physicist, may be involved in RIT.

What equipment is used?

In addition to equipment needed to start and maintain an IV, images may be obtained with a gamma camera before or after the therapy. Often, SPECT imaging will also be performed.

The gamma camera, which is encased in metal, is capable of detecting radiation and taking pictures from different angles. It may be suspended over the examination table or it may be beneath the table. Often, gamma cameras are dual-headed with one camera above and one camera beneath the table. The camera could also be located within a large, doughnut-shaped scanner similar in appearance to a computed tomography (CT) scanner. In some imaging centers, the gamma camera is located beneath the exam table and out of view.

SPECT uses a gamma camera that rotates around the body to produce more detailed, three-dimensional images.

Who operates the equipment?

A radiologist who has specialized training in nuclear medicine or a nuclear medicine physician will supervise the technologist, who will be directly operating the gamma camera.

Is there any special preparation needed for the procedure?

You should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to local anesthetic medications, general anesthesia or to contrast materials containing iodine (sometimes referred to as "dye" or "x-ray dye"). Your physician may advise you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners for a specified period of time before your procedure.

Women should always inform their physician or technologist if there is any possibility that they are pregnant or if they are breastfeeding. See the Safety page for more information about pregnancy and breastfeeding related to nuclear medicine imaging.

RIT is generally not administered to pregnant women and children.

Pre-screening of patients will occur to ensure proper blood counts and lack of significant bone marrow involvement with disease. Patients who have had prior bone marrow transplantation or failed stem cell collection should not receive RIT.

You will speak to a radiation safety specialist regarding radiation safety precautions.

How is the procedure performed?

RIT is usually performed on an outpatient basis and involves several separate visits to the hospital or healthcare facility.

On the first visit, the patient receives a dose of the monoclonal antibody (without radioactive material) via an intravenous (IV) injection. Once in the bloodstream, the monoclonal antibody will attach to non-malignant B cells in the body and protect them from the radiation that will be used in treatment. This IV infusion may take up to two hours. The patient may also receive an intravenous dose of the radiotracer.

If radiotracer was injected, the patient will return to the hospital or healthcare facility during the next week to have a series of images taken to determine where the radiotracer has traveled in the body and how long it remains there. The information obtained from these imaging scans will determine if the patient is a candidate for RIT and will help in planning the treatment.

The actual treatment is given in an IV infusion usually seven to nine days after the first scan and involves an intravenous injection of both the radioactive agent and monoclonal antibody.

What will I feel during this procedure?

Except for intravenous injections, most nuclear medicine procedures are painless and are rarely associated with significant discomfort or side effects.

When the radiotracer is given intravenously, you will feel a slight pin prick when the needle is inserted into your vein for the intravenous line. When the radioactive material is injected into your arm, you may feel a cold sensation moving up your arm, but there are generally no other side effects.

Are there side effects from the procedure?

The most serious side effect of RIT therapy is reducing blood counts. This side effect may occur as late as several months after treatment. As with chemotherapy or radiation therapy, this lowering of blood counts may result in bleeding or infection. It is important to follow up with your treating physician on a regular basis. Frequent blood draws will be performed to monitor your blood count. There is a small risk of bone marrow damage.

Additional side effects of RIT, which are usually short-term, may include an allergic reaction, fever, chills, low blood pressure, diarrhea and rash.

Hypersensitivity reactions from the monoclonal antibodies are rare, with occurrences increasing with multiple therapies. Typically all patients will be pretreated with acetaminophen (Tylenol®) or diphenhydramine (Benadryl®).

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